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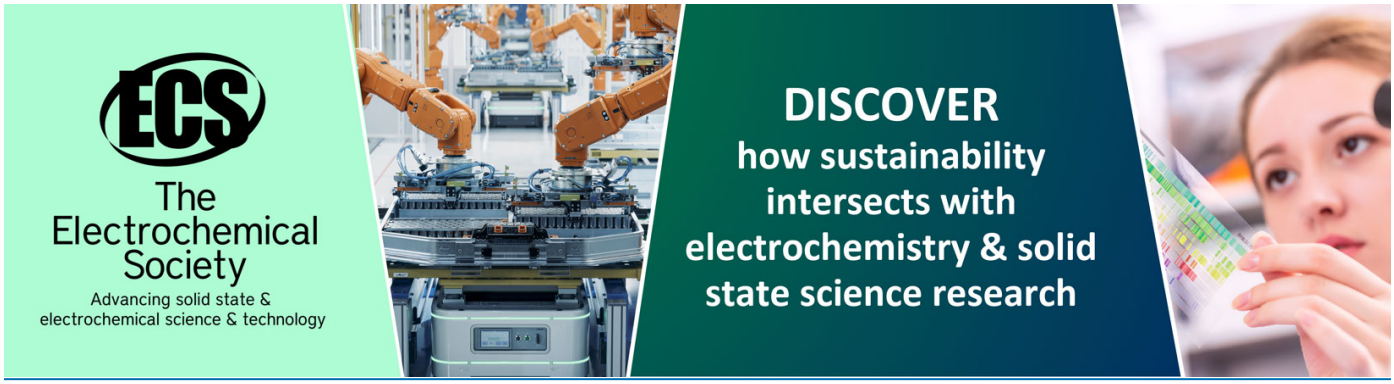

Analysis of Lead (Pb) and Zinc (Zn) Content in Sediments and *Faunus ater* at Bale Lhoknga Aceh Besar District

Rahmi Agustina[1,2]*, M. Ali Sarong[3], Fredinan Yulianda[4], Suhendrayatna[5], Rahmadi[6], Lelifajri[7]

[1]Graduate School of Mathematics and Applied Sciences Syiah Kuala University, Banda Aceh Indonesia 23111
[2]Departement of Biology,Faculty of Teacher Training and Education, Jabal Ghafur University, Sigli Indonesia 24171
[3]Departement of Biology,Faculty of Teacher Training and Education Syiah Kuala University Banda Aceh Indonesia 23111
[4]Departement of Water Resources Management Faculty of Fisheries and Marine Sciences, Bogor Agricultural University, Bogor Indonesia 16680
[5]Department of Chemical Engineering, Faculty of Engineering, Syiah Kuala University, Banda Aceh Indonesia 23111
[6]Department of Chemistry, Faculty of Mathematics and Science, Post Graduate Program, Syiah Kuala University, Banda Aceh Indonesia 23111
[7]Department of Chemistry, Faculty of Mathematics and Science, Post Graduate Program, Syiah Kuala University, Banda Aceh Indonesia 23111

*Corresponding author e-mail: ami.binti.asyar@gmail.com

Abstract. Faunus ater is a favoritemollusca that is often found on the Bale River. Local people use these snails as food for consumption along with their main food. Bale River itself is located adjacent to the cement factory, used water washing machines distributed to the river is feared to support the presence of lead (Pb) and zinc (Zn) metals in the river. This study aims to analyze the relationship of Pb and Zn content in sediments to the content of Pb and Zn in Faunus ater. Data collection was carried out in Februari until April 2018. The relationship between Pb and Zn content in sediments with Pb and Zn content in the body of Faunus ater was analyzed by correlation analysis. The results of the data analysis showed that the metal content of Pb and Zn in sediment and Faunus aterwere found to vary. The highest Pb content in sediment was found at station 2 in March, amounting to 32.87 mg / kg. while the highest Zn content was found at station 1 in March amounting to 84 mg / kg. The relationship of heavy metals Pb and Zn in sediments to the content of Pb and Zn in the body of Faunus ater showed a negative correlation. The conclusion of this study is that there is no correlation between the content of Pb and Zn heavy metals in sediments on the content of lead Pb and Zn in the body of Faunus ater at the Bale Lhoknga River in Aceh Besar District.

1. Introduction

The river is a form of aquatic ecosystem that has an important role in the hydrological cycle, and serves as a catchment area for the surrounding area [1], so that the condition of a river is strongly

influenced by the characteristics of the surrounding environment The river is also an easy and practical place for waste disposal, both solid and liquid, as a result of industrial activities, households, garments, livestock, and other small industries. The presence of heavy metals in waters is dangerous both directly to the life of the organism and its effects indirectly on human health. This is due to the properties of heavy metals that are difficult to degrade so that heavy metals are easily accumulated in marine biota, especially fish and shellfish. Existing heavy metals in the water will descend and settle on the bottom of the waters, forming sediments so as to provide greater exposure to shrimp, shellfish and crabs

In Aceh Besar region there are several rivers that flow in industrial estates and residential environments, one of which is the Bale river. Bale River is located in the Lhoknga sub-district and is directly adjacent to a cement factory. Sungai Bale it self empties directly into the Hindia Ocean, namely the lhoknga beach. Generally coastal waters are very rich in biodiversity, including mollusks. Molluscs in the animal world are the second largest phylum after Arthropoda. The number of species is around 50,000-110,000 living species and 35,000 fossil species. Phylum mollusc consists of eight classes namely Caudofoveata, Aplacophora, Monoplacophora, Polyplacophora, Cephalopoda, Scaphopoda, Gastropods, and Bivalves. The two largest classes of mollusc phylum are Gastropoda and Bivalvia

Gastropod are generally better known as snails. Gastropods vary greatly in shape and size. Gastropods have a single threaded shell, the head is well developed, equipped with tentacles and eyes. Wide and muscular legs to creep and support visceral mass. *Faunus ater* (black snail) is one type of mollusk which is often found in the river bale. the people who live around the Bale river utilize (*Faunus ater*) whose presence is quite abundant for consumption. Faunus ater is one of the sources of protein that is very popular with the local community in addition to its savory taste, this snail is very easy to find in local traditional markets.

Initial analysis carried out on the Bale river, found a number of heavy metals, Pb and Zn were the dominant ones. Lead (Pb) belongs to a group of metals that are toxic and harmful to the life of living things. Lead Lead (Pb) can enter the body of the water naturally by crystallizing Pb in the air with the help of rainwater. The use of Pb on a large scale can cause good pollution on land and water. Metal Pb that enters the waters as a result of human activities can form waste and then settle known as sediment.Initial analysis carried out on the Bale river, found a number of heavy metals, Pb and Zn were the dominant ones. Lead (Pb) belongs to a group of metals that are toxic and harmful to the life of living things. Lead Lead (Pb) can enter the body of the water naturally by crystallizing Pb in the air with the help of rainwater. The use of Pb on a large scale can cause good pollution on land and water. Metal Pb that enters the waters as a result of human activities can form waste and then settle known as sediment. Sediments are the lower layers that line rivers, lakes, bays, estuaries and oceans. Usually, the content of heavy metals in sediments is higher than the content of heavy metals that enter the waters that will experience sedimentation [2]. The high content of lead in sediment will cause polluted aquatic biota such as fish, shrimp and shellfish, where the biota lives on the river bed and if consumed can be harmful to health. The occurrence of a change in the water will have an impact on the organisms that live in it.

The existence of heavy metals in the waters is very dangerous directly to the life of aquatic biota, which subsequently affects indirectly to human health. This is related to the properties of heavy metals that are difficult to degrade, so that they accumulate in the aquatic environment and their presence is naturally difficult to remove. can accumulate in aquatic biota such as snails, shellfish, and fish and in sediments [3]. The presence of lead and Zn heavy metals in waters and in bale river sediments will affect the metal content of Pb and Zn in Faunus ater, if used as food, it will be harmful to human health.

2. Methodology

Sampling in the form of water, sediment, and Faunus is carried out on the Bale River using the standard method. The location of the collection is divided into 3 stations: station 1 is located in the

upper reaches of the river, station 2 is in the river flow section, and station 3 is near the river mouth. Each station was assigned 3 sampling plots each measuring 1m x 1m which were systematically determined. Collection of samples of sediment and faunusather is done by diving and taking directly from the bottom of the water, then put into sample bottles that have been labeled according to the observation station and transported to the laboratory for the analysis process. Accumulation of heavy metals in the atherent and sedimentary faunus was analyzed by using Atomic Absorption Spectrophotometer, Shimadzu AA 630 [4] after being deducted by the Toxicity Characteristic Leaching Procedure method [5].

3. Results and Discussion

3.1 Pb and Zn content in Bale River

the content of Pb and Zn in *Faunus ater* and sediment in Bale River for each station for 3 months of observation are tabulated in Table 1.

Table 1. Concentrations of Pb and Zn in sediments and *Faunus ater* in Bale River

Observation Station	sample	Concentrations of Pb and Zn(mg/kg)					
		February		March		April	
		Pb	Zn	Pb	Zn	Pb	Zn
Station 1	sediments	14,31	71,36	17,21	84,53	tt	46,50
	F. ater	tt	12,06	4,53	15,05	tt	16,48
Station 2	sediments	tt	tt	32,87	44,06	tt	32,37
	F. ater	tt	8,63	1,11	15,86	tt	16,83
Station 3	sediments	16,59	15,86	22,08	39,72	tt	21,05
	F. ater	tt	12,02	1,15	16,83	tt	22,41

tt: not detected

Pb and Zn content in sediments and Faunus ater were found to vary. The highest Pb content in sediment was found at station 2 in March, amounting to 32.87 mg / kg. while the highest Zn content was found at station 1 in March at 84 mg / kg. This heavy metal content can be varied because due to differences in ecological conditions in the area where in March the weather tends to be extreme with marked occurrence of several storms causing unstable water flow. River flow can affect the accumulation of heavy metals in sediment and Faunus ater. This situation is different from the results of analysis on Zn metal, where the metal is found both in sediment and accumulated in Faunus ater at each observation station. The biodegradable nature of Pb is an indication of this difference. Station 1 is located exactly in the drainage area of the cement factory, while Station 2 is a river basin with many biota. Station 3 approaches the coastal area so that the condition of the waters has mixed with sea water, so the possibility of heavy metals decomposing is greater.

3.2 Correlation of Pb content in sediments and in Faunus ater in Bale River

The results of data analysis showed that there was no correlation between Pb content in sediments and Pb content in *Faunus ater* Tables 2 and 4 show that there is no Pb content at all in the *Faunusater*aunus body at the sampling of the Februari and April.

Table 2. Pb content in sedimen dan *Faunus ater*on February

February	Pb in Sediment	Pb in Faunus ater
Station 1	14.315	tt
Station 2	tt	tt
Station 3	16.588	tt

r

Table 3. Pb content in sedimen dan *Faunus ater*on March

Mach	Pb in sediment	Pb in *Faunus ater*
Station 1	17.2096	4.533
Station 2	32.8703	1.114
Station 3	22.082	1.151
	r	-0.74590074

Table 4. Pb content in sedimen dan *Faunus ater*on April

April	Pb in sediment	Pb in *Faunus ater*
Station 1	tt	tt
Station 2	tt	tt
Station 3	tt	tt
	r	

Data in March even though there was Pb content, but the results of linear regression analysis showed a negative relationship with the equation y = -0.0129x + 2.6116 with a coefficient of determination R^2 = 0.0136. that means that the concentration of Zn in River water to sediment is 1.3% while the other is 98.7%. (Picture 1). This negative relationship is thought to be due to activities in the waters such as currents that cause the *Faunus ater* to move frequently. Competition against substrates is also one of the reasons why *Faunus ater* are not grouped in one place. So that *Faunus ater* is not continuous in the same sediment.

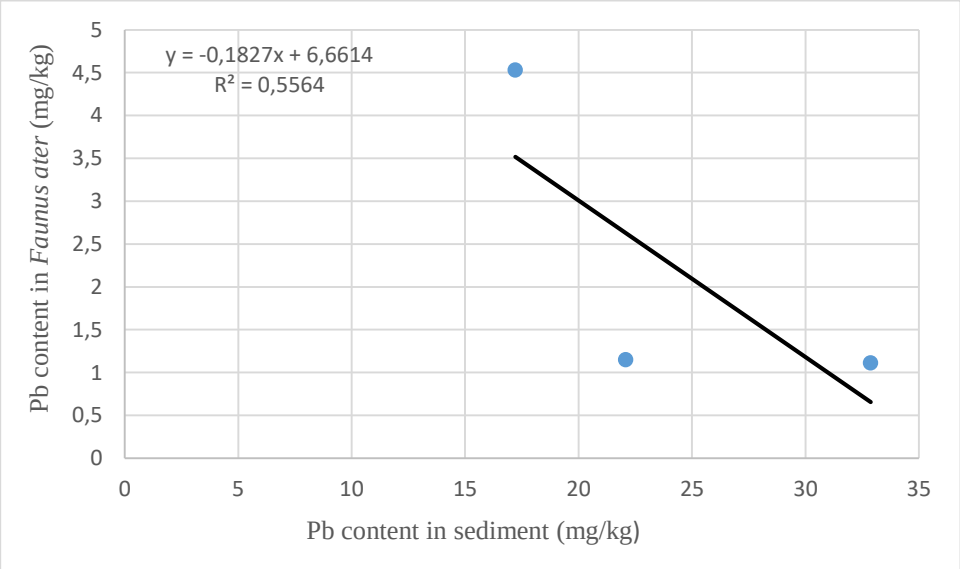

Figure 1. Correlation of Pb Content in Sediment and in *Faunus ater* on March

3.3 Correlation of Zn content in sediments and in Faunus ater in Bale River Waters
Based on the results of statistical tests, the correlation of Zn heavy metal concentrations in snails with sediments also showed a negative correlation, meaning that the concentration of Zn in the sediment did not affect the concentration of Zn in the body of *Faunus ater*. Data can be seen in tables 5, 6 and7.

Table 5. Concentration of Zn in sediments and Faunus ateron February

February	Zn in sediment	Zn in Faunus ater
Station 1	71.36	12.06
Station 2	tt	8.635
Station 3	15.864	12.021
	r	

Table 6. Concentration of Zn in sediments and Faunus ateron March

March	Zn in sediment	Zn in Faunus ater
Station 1	84.5312	15.054
Station 2	44.0575	15.865
Station 3	39.721	16.8323
	r	-0.88399524

Table 7. Concentration of Zn in sediments and Faunus ateron April

April	Zn in sediment	Zn in Faunus ater
Station 1	46.505	16.48
Station 2	32.372	16.8298
Station 3	21.055	22.413
	r	-0.86035374

The fluctuations in the content of heavy metals in the sediment and in the body of a snail as shown in table 2, can occur due to the mobility of some individual Faunus ater, although Faunus ater is an attached animal but the influence of current and river water discharge will affect its movement. more clearly can be seen in Figures 6 and 7

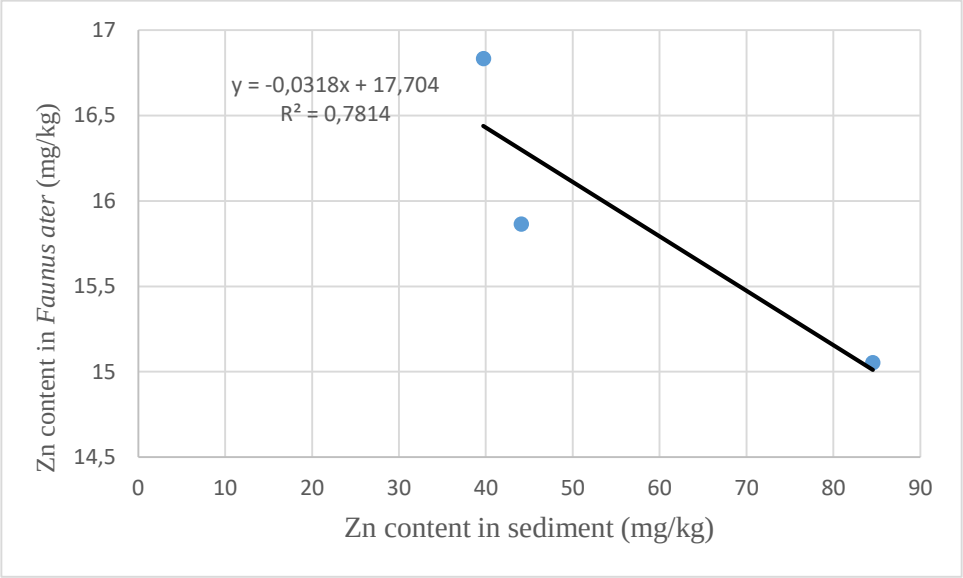

Figure 2. Correlation of Zn Concentration in Sediments and Zn on *Faunus ater* in March

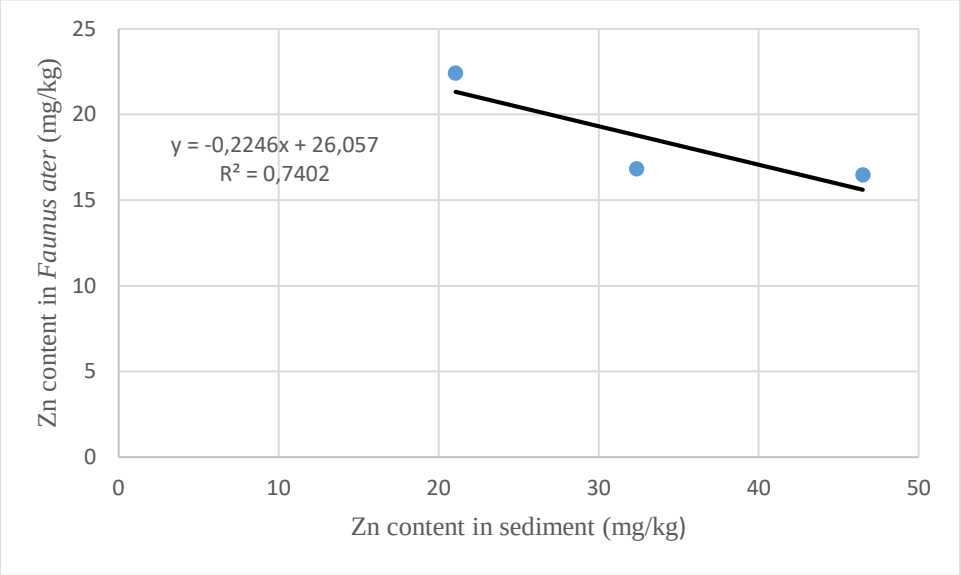

Figure 3. Correlation of Zn Concentration in Sediments and Zn on *Faunus ater* on April

4. Conclusion

Pb and Zn content in sediments and *Faunus ater* were found to vary in each observation month. The highest Pb content in sediment was found at station 2 in March, amounting to 32.87 mg/kg. while the highest Zn content was found at station 1 in March amounting 84 mg/kg. There is no correlation between the content of heavy metals Pb and Zn in sediments in the content of Pb and Zn in the body of *Faunus ater* at Sungai Lhoknga, Aceh Besar District.

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